The Compact High Resolution Imaging Spectrometer on the ESA PROBA Mission

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Abstract:

The PRoject for On-Board Autonomy (PROBA) is a technology demonstrator mission for on-board autonomy of small and agile platforms suitable for small scientific and application missions. The PROBA payload comprises several 'announcement of opportunities' instruments to demonstrate platform pointing and data management capabilities. One of the payload instruments is the Compact High Resolution Imaging Spectrometer (CHRIS) built by SIRA Electro-Optics Ltd. (UK) and funded BNSC (UK) and SIRA Electro-Optics Ltd. (UK).
The PROBA mission is scheduled to be launched on an Indian launcher together with IRS-P5 early 2001.

CHRIS covers the visible and near-infrared (VNIR) spectral region (400 - 1050nm) with a minimum spectral sampling interval ranging from 1.25 to 11nm depending on the wavelength position. The spatial resolution is selectable between a 'fine resolution mode' providing 25m x 25m at nadir and a 'coarse resolution mode' providing 50m x 50m at nadir. The swath width varies accordingly between 18.7 km and 37.4 km (748 pixels) for an orbit-altitude of 830km. The number of bands, their positions and width are programmable. 19 bands are available for the fine resolution mode, 62 bands for the coarse resolution mode. Across-track pointing for areal access and along-track pointing for directional observations (5 different directions for BRDF acquisitions) are possible due to the agility of the PROBA platform. Further, the signal integration time (dwell time) can be increased by a 'motion compensation technique' to increase the signal to noise ratio (SNR) of low albedo targets. In addition to this, selectable gain-settings are available for optimum use of the 12 bit radiometric resolution.

The scientific objective of CHRIS is to provide reflectance data in the VNIR for atmospheric, land surface and coastal studies.
Atmospheric studies concentrate on aerosol (type and loading) and column water vapour retrievals. Both variables can be used for atmospheric corrections, a necessary pre-processing step for further retrievals.
Land surface studies will concentrate on retrieval of biophysical variables using different techniques ranging from traditional band rationing (indices), through red-edge

parametrisation (e.g. inverted Gaussian fit), to more advanced techniques such as BRDF model inversion.

In the framework of its Earth Observation Preparatory Programme (EOPP) the European Space Agency (ESA) released an 'Announcement of Opportunity' (AO), inviting scientists worldwide to participate in the CHRIS data exploitation. Proposals received in response to the AO support geophysical algorithm development, calibration/validation and the simulation of future spaceborne Earth observation missions. It is the objective of this paper to outline the Agency's data exploitation plan.